Volume Title: The Service Economy

Volume Author/Editor: Victor R. Fuchs, assisted by Irving F. Leveson

Volume Publisher: NBER

Volume ISBN: 0-87014-475-8

Volume URL: http://www.nber.org/books/fuch68-1

Publication Date: 1968

Chapter Title: Some Implications of the Growth of a Service Economy

Chapter Author: Victor R. Fuchs

Chapter URL: http://www.nber.org/chapters/c1162

Chapter pages in book: (p. 183 - 199)

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SOME IMPLICATIONS
OF THE GROWTH
OF A SERVICE ECONOMY

The preceding chapters have delineated the shift of employment to serv-
ices, have suggested some of the reasons for this shift, and have hinted
at some of the implications. In this chapter we will take a longer and
closer look at some aspects of the growth of a service economy. It will
be argued that this growth has important implications for society, and
that it also has important implications for economic analysis.

To be sure, such an attempt to look into the future is subject to many
qualifications. A shift in the relative importance of different industries
is only one of many changes that are occurring simultaneously in the
economy, and these other changes may tend to offset the effects of inter-
industry shifts. Also, these shifts themselves may set in motion changes
with implications different from those discussed here. Nevertheless, given
the rapid growth of the service industries, it is useful to consider differ-
ences between them and the rest of the economy.

As Chapters 2 and 3 make clear, the dramatic shift to services has
occurred in employment—not in output. A question arises, therefore,
about the validity of the emphasis given here to the growth of a service
economy. It is probably true that for some economic questions the indus-
trial distribution of employment is of no greater significance than the
industrial distribution of output or of physical capital. A million dollars'
worth of capital input can be said to have as much economic significance
as a million dollars' worth of labor input. But labor is human and physical
capital is not; it is appropriate, therefore, to give labor primary attention
in any broad study concerned with total social development.

Changes in the industrial distribution of employment have implications
for where and how men live, the education they need, and even the health
hazards that they face. Indeed, it has been written that "When man

changes his tools and his techniques, his ways of producing and distributing the goods of life, he also changes his gods." [1]

A hypothetical example may help to clarify the point. Suppose we had an economy in which inputs of physical capital and human labor were roughly equal in economic importance; i.e., the annual value of the services flowing from each was approximately equal. Suppose further that 90 per cent of the physical capital and 10 per cent of the labor were employed in Industry, and 10 per cent of the capital and 90 per cent of the labor in the production of services. Although the sectors would be equal in economic importance, it seems reasonable to expect that the dominant tone of the society would be set by the service component. The kind of work people do, the kinds of organizations they work for, the location of the work, and many other critical aspects of their lives would be different than if capital and labor were equally divided between the two sectors. [2]

Implications for the Economy

Labor Force

Differences between the Industry and Service sectors are most noticeable with respect to labor force characteristics. Some of these differences are shown in Table 66 and expanded upon in Tables 67–70. Probably the most significant one is that many occupations in the Service sector do not make special demands for characteristically male qualities, such as physical strength. This means that women can compete on more nearly equal terms with men. We find women holding down almost one-half of all service jobs compared with only one-fifth of those in the Industry sector. More detailed information on the sex distributions in the two sectors is presented in Table 67.

We see that over half of all man-hours in the Industry sector are worked in industries with negligible (under 15 per cent) female employment. By contrast, in the Service sector more than 60 per cent of the man-hours are worked in industries with at least 30 per cent female employment.

We also find proportionately more older workers in services, despite the fact that this is the more rapidly growing sector and would therefore

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[1] Harvey Cox, *The Secular City*, New York, 1965, p. 8.

[2] Another possible source of difference is that there may be more socially desirable externalities associated with the production of services than with the production of goods. See Arthur Treadway, "What Is Output?—Problems of Concept and Measurement," in *Production and Productivity in the Service Industries*, V. R. Fuchs, ed., NBER, in press.

TABLE 66

Labor Force Characteristics, Industry and Service Sectors, 1960 [a]

	Percentage of U.S. Total in		Percentage of Sector Employment	
	Industry	Service	Industry	Service
1. All employed [b]	43	50	100	100
2. Females	27	71	20	46
3. Over 65	25	59	3	5
4. Part-timers	34	59	18	27
5. Self-employed [c]	16	50	5	13
6. Union members	82	17	57	9
7. More than 12 years of school	30	68	14	28
8. Fewer than 9 years of school	49	37	34	22

Source: Rows 1–5, *U.S. Census of Population, 1960;* row 6, H. G. Lewis, *Unionism and Relative Wages in the United States,* 1963, p. 251; rows 7–8, NBER tabulations of the 1960 U.S. Census of Population 1/1,000 sample.

[a] For sector definitions, see Table 1.

[b] Civilian employment, includes unpaid family workers.

[c] Excludes unpaid family workers.

TABLE 67

Distribution of Industries and Man-Hours by Percentage
of Female Employment, Industry and Service Sectors, 1960

Percentage Female	Number of Industries		Percentage of Industries		Percentage of Man-Hours	
	I	S	I	S	I	S
0 to 15.0	39	12	48.1	21.1	56.6	15.1
15.1 to 30.0	23	16	28.4	28.1	21.5	23.3
30.1 to 45.0	9	14	11.1	24.6	12.7	17.2
45.1 to 60.0	6	7	7.4	12.3	4.7	16.2
60.1 and over	4	8	4.9	14.0	4.4	28.2

Source: Appendix Table I–2.

tend to have a disproportionately large number of young workers. One reason why women and older workers are attracted to the Service sector is that it provides greater opportunities for part-time employment. Almost three out of every ten workers in the Service sector in 1960 worked fewer than thirty-five hours a week. Sector differences in the role of part-timers in 1948 and 1963 are presented in greater detail in Table 68. We see that trade and services in particular have employed large numbers of part-timers and that the number has grown appreciably in the postwar period. If data were available on those working fewer than thirty-five hours per week *voluntarily,* the difference between the sectors would probably be even greater than that shown.

Table 66 shows that self-employment is relatively twice as important in the Service sector as in Industry. Moreover, the Census of Population may understate the number of self-employed in Services relative to Industry because corporate employees are classified as wage and salary workers regardless of the size of the corporation. The officers of small, owner-managed corporations are, for analytical purposes, similar to partners or individual proprietors, and should be considered self-employed. About three-quarters of such corporations are in the service industries.

It has been widely believed that opportunities for self-employment are

TABLE 68

Percentage of Wage and Salary Workers Working Fewer Than 35 Hours, By Industry, 1948 and 1963

	May 1948	May 1963	Change, 1948–63
Industry sector	9.6	10.6	+1.0
Service sector	16.3	23.8	+7.5
Mining, forestry, and fisheries	11.3	7.9	−3.4
Construction	16.2	16.9	+0.7
Manufacturing	9.1	9.4	+0.3
Transportation and public utilities	6.3	9.7	+3.4
Wholesale and retail trade	14.7	24.1	+9.4
Finance, insurance, and real estate	7.8	12.5	+4.7
Service industries [a]	23.7	30.7	+7.0
Public administration	5.3	8.7	+3.4

Source: 85th Congress, First Session, House Education and Labor Committee, Hours of Work, Hearings before the Select Subcommittee on Labor, on HR 355, HR 3102, and HR 3320, Washington, D.C., 1963, Part I, p. 78.

[a] These include personal, professional, business, and repair services.

TABLE 69

Distribution of Industries and Man-Hours By Self-Employment Income
as Percentage of Total Earnings, Industry and Service Sectors, 1960

Self-Employment Earnings as Percentage of Total Earnings	Number of Industries		Percentage of Industries		Percentage of Man-Hours	
	I	S	I	S	I	S
0 to 9.99	69	9	85.2	15.8	78.2	33.9
10 to 19.99	8	10	9.9	17.5	7.5	16.6
20 to 29.99	3	17	3.7	29.8	13.8	21.2
30 and over	1	21	1.2	36.8	.4	28.4

Source: Appendix Table I-2.

diminishing in the United States. But if one excludes the decline of agriculture, this is no longer true.[3] Table 69 shows that self-employment plays a large role in many service industries. Indeed, self-employment income represents over 30 per cent of total earnings in twenty-one service industries that account for 28.4 per cent of total man-hours worked in the Service sector.

The role of self-employment in the future will be determined by several conflicting trends. The growth of nongovernmental services will tend to favor it, but this may be offset by the growth of government employment and by the influx of young workers and women into the labor force, since these groups are predominantly wage and salary workers. There may also be some tendency toward larger firms within each individual industry, but there is little reason to think that the door to self-employment will be closed as long as services continue to grow.

Given the importance of females, part-time employment, and self-employment in the Service sector, it is not surprising to find a vast difference in the importance of unions in the two sectors. This difference is shown in some detail in Table 70. We see that no Service industry was as much as 40 per cent unionized in 1960, and that only a few reached the 20 per cent level. In the Industry sector, on the other hand, 75 per cent of the man-hours were worked in industries with at least 40 per cent unionization.

[3] See John E. Bregger, "Self-Employment in the United States 1948–1962," *Special Labor Force Report No. 27, Monthly Labor Review,* January 1963, and Irving Leveson, "Nonfarm Self-Employment in the U.S.," unpublished Ph.D. dissertation, Columbia University, January 1968.

TABLE 70

Distribution of Industries and Man-Hours By Percentage
Unionized, Industry and Service Sectors, 1960

Percentage of Employment Unionized	Number of Industries		Percentage of Industries		Percentage of Man-Hours	
	I	S	I	S	I	S
0 to 19.99	6	52	7.4	91.2	6.4	95.0
20 to 39.99	23	5	28.4	8.8	19.1	5.0
40 to 59.99	33	0	40.7	0	50.3	0
60 and over	19	0	23.5	0	24.3	0

Source: Appendix Table I-2.

The continued growth of services may mean a decline in union influ-
ence in the United States. On the other hand, if unions are successful in
organizing the Service sector to the same extent as the Industry sector,
we may see a significant change in the nature of the union movement.
The spread of unionism to service workers would probably also have
implications for labor quality, productivity, and unemployment in those
industries.

Although unionization is not widespread in services, considerable at-
tention has been directed to strikes in that sector in recent years. Walk-
outs by teachers, sanitation workers, and hospital employees have pro-
voked relatively more comment and intervention than much longer strikes
by workers in mining, manufacturing, and construction. This is probably
related in part to the perishable nature of service output. One possible
implication of the spread of unionism to services is growing pressure for
compulsory arbitration and other modifications in traditional approaches
to collective bargaining.

The last two rows of Table 66 reveal interesting sector differences in
education. The service industries make greater use of workers with
higher education and relatively less use of those with only limited school-
ing. This is not true for all service industries, of course, but it is true for
the sector on average.[4]

There is another implication concerning labor which is not readily
apparent in the statistics but which is potentially of considerable impor-

[4] As indicated in footnote 6, Chap. 7, we are discussing the higher *level* of edu-
cation of service industry employees. This should not be confused with *changes* in
the level of education, which have been greater in the Industry sector.

tance. For many decades we have been hearing that industrialization has alienated the worker from his work, that the individual has no contact with the final fruit of his labor, and that the transfer from a craft society to one of mass production has resulted in the loss of personal identification with work.

Whatever validity such statements may have had in the past, a question arises whether they now accord with reality. The advent of a service economy may imply a reversal of these trends. Employees in many service industries are closely related to their work and often render a highly personalized service that offers ample scope for the development and exercise of personal skills.[5]

This is true of some goods-producing occupations as well, but the direct confrontation between consumer and worker that occurs frequently in services creates the possibility of a more completely human and satisfying work experience. To be sure, within many service industries there is some tendency for work to become less personalized (e.g., teaching machines in education, self-service counters in retailing, and laboratory tests in medicine); but with more and more people becoming engaged in service occupations, the net effect for the labor force as a whole may be in the direction of the *personalization* of work.

It should be stressed that deriving satisfaction from a job well done and taking pride in one's work are only possibilities, not certainties. Teachers can ignore their pupils; doctors can think more of their bank balances than of their patients. The salesman who must go through life with an artificial smile on his face while caring little for his customers and less for what he sells is often held in low regard. But at their best many service occupations are extremely rewarding, and the line between "work" and "leisure" activity is often difficult to draw.

Some service occupations, especially some personal services, are not well-regarded in this country. In a country with a high average level of income, however, one should expect that a large amount of personal service will be consumed and that a large number of people will be so employed. This would be true even if the income distribution were completely egalitarian. High per capita income implies high average output per man. This is likely to mean *very* high output per man in some industries (where capital can be substituted for labor, and technological change is rapid). Employment, therefore, will probably expand primarily in those industries, such as personal services, where output per man advances slowly. Our attitudes toward personal services are not immu-

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[5] For example, health, education, entertainment, personal services, repair services.

table laws of nature; they can be changed. Such a change would, I sus-
pect, reduce unemployment and increase consumer satisfaction.

Industrial Organization

The shift of employment to the Service sector carries with it important
implications for industrial organization in the United States because the
size of the "firm" and the nature of ownership and control are typically
different in Services than Industry.

In Industry, with some notable exceptions, such as construction, most
of the output is accounted for by large corporations. Ownership is fre-
quently separate from management, and significant market power held
by a few firms in each industry is not uncommon.

In the Service sector, on the other hand, and again with some excep-
tions, firms are typically small, usually owner-managed and often non-
corporate. Furthermore, nearly all firms in the Industry sector are organ-
ized for profit, whereas nonprofit operations, public and private, account
for one-third of the Service sector's employment.

Table 71 summarizes some of the available information concerning

TABLE 71

Percentage Distribution of Employment, by Size of Firm or Employer,
Manufacturing and Selected Service Industries

	Number of Employees	
Industries	Fewer than 20	Fewer than 500
1. Manufacturing (1958)	7	38
2. Wholesale trade (1958)	47	93
3. Retail trade (1958)	56	78
4. Selected services (1958)	57	87
5. Finance, insurance, and real estate (1956)	41	67
6. Hospitals (nongovernmental, 1963)	n.a.	52
7. Local government (1962)	n.a.	49

Source: Rows 1–4, Bureau of the Census, *Enterprise Statistics: 1958 Part 1, General
Report*, p. 30, adjusted to include self-employed proprietors by assuming that they are in
firms with fewer than twenty employees; row 5, Betty C. Churchill, "Size of Business
Firms," *Survey of Current Business*, September 1959, p. 19, adjusted for self-employed
proprietors as rows 1–4; row 6, American Hospital Association, *Hospitals*, Guide Issue,
1964, estimated from distributions by number of beds; row 7, Census of Government,
Compendium of Government Employment, 1962, estimated in part.

TABLE 72

Distribution of Industries and Man-Hours, by Percentage of Employment
in Establishments With Over 250 Employees, Industry
and Service Sectors, 1960

Percentage of Employment in Establishments With Over 250 Employees	Number of Industries		Percentage of Industries		Percentage of Man-Hours	
	I	S	I	S	I	S
0 to 19.99	10	44	12.3	77.2	17.4	70.3
20 to 39.99	22	9	27.2	15.8	22.6	16.0
40 to 59.99	15	1	18.5	1.8	17.3	3.7
60 to 79.99	20	2	24.7	3.5	18.6	8.4
80 and over	14	1	17.3	1.8	24.1	1.6

Source: Appendix Table I-2.

the distribution of employment in different service industries by size of
employer. The size distribution in manufacturing is included for com-
parison. In wholesale trade, retail trade, and selected services, accounting
for more than 50 per cent of the Service sector, half of the employment
is in companies with fewer than twenty workers. In finance, insurance,
and real estate, 40 per cent is in very small firms. Another large
fraction of Service sector employment is accounted for by self-employed
professionals and domestic servants, not shown in the table. They repre-
sent the extreme in small size of employer.

Private (i.e., nongovernmental) hospitals are considerably larger than
the typical service firm; but even so, more than half the total employment
of these institutions is in hospitals with fewer than 500 employees. Simi-
larly, most private schools and colleges are relatively small.

Government, which is often referred to as a "huge bureaucracy," actu-
ally includes many small employers. It is worth noting that employment
at the local level of government now exceeds that of state and federal
(civilian) government combined. One-half of this local employment is
in governmental units with fewer than 500 employees.

Table 72 presents some additional detail concerning the size of estab-
lishments in the two sectors. In Industry, employment is evenly distrib-
uted among all types of industries, ranging from those in which most of
the employment is in small establishments to those in which very little
of the employment is in small establishments. Service sector employment

is heavily concentrated in industries characterized by small-scale operations.

Because of the importance of small firms and nonprofit organizations in the Service sector, the growth of this sector has tended to limit the pervasiveness of business corporations in the economy. In the first half of this century, the corporation's role grew steadily, but its relative importance apparently reached a peak about 1956 when corporations accounted for over 57 per cent of total national income. Since then there has been a tendency for this fraction to remain stable, or even to show some decline, despite changes in the tax laws which encourage incorporation.

Other things being equal, the shift to services tends to increase the relative importance of small firms in the economy. There are, however, forces within many industries that tend to increase the size of the average "firm." The pressure for consolidation of school districts and other local government units is a notable example. Bank mergers is another. The net effect of these countertendencies is difficult to predict.

Industries in which small firms account for the bulk of the output typically do not present industrial control problems of the "trust-busting" variety. On the other hand, the growth of such industries may increase the need to guard against the restrictive practices of trade associations and professional organizations. Small firms may pose another problem for the economy because it is alleged that they do not allocate sufficient resources to research and other activities with large external benefits.

The growing importance of the nonprofit sector will probably pose some disturbing questions about how to promote efficiency and equity in such organizations (for example, the problems associated with increasing costs in voluntary hospitals). When nonprofit operations represent only a minor exception to an essentially private-enterprise economy, the problem is not very serious. But if we ever reach the stage where nonprofit operations tend to dominate the economy, we probably will be faced with the need for radically new instruments of regulation and control.

Sector Differences and Rates of Growth

Table 73 presents summary measures of industry characteristics by sector, and for groups of industries within each sector, classified according to their rate of growth of employment, 1929–65. There were, for instance, thirteen industries in the Industry sector and twelve in the Service sector that had above average rates of growth in employment. The median measures for these industries for each characteristic are

TABLE 73

Industry Characteristics, by Sector and Rate of Growth
of Employment, 1929–65 [a]
(median values)

	Employment Growth, 1929–65 [b]					
	Above Average		Below Average		All Industries	
	Indus-try	Serv-ice	Indus-try	Serv-ice	Indus-try	Serv-ice
No. of Industries [c]	13	12	20	6	33	18
Characteristic:						
Per cent female	14.6	37.8	12.1	44.5	12.9	38.3
Per cent 65 years of age and over	1.9	4.6	2.6	6.7	2.2	5.6
Per cent working less than 35 hrs. per wk.	6.7	13.0	10.2	28.3	8.7	17.1
Self-employment income as % of total earnings	5.9	19.2	4.2	22.1	4.6	19.7
Per cent unionized	51.0	1.5	52.5	20.5	52.0	4.5
Per cent with 12 yrs. schooling and over	54.7	69.2	34.2	37.2	41.2	61.4
Per cent in large establishments (over 250 employees)	61.9	11.5	50.0	8.0	58.7	9.1

Source: See Appendix Table C–6 and Appendix I.

[a] Figures for industry characteristics based on data for 1960.

[b] Median rate of growth = 1.44 per cent per annum.

[c] These industries roughly correspond to the Office of Business Economics classification, and the rates of growth of employment were calculated from that source. A few industries were combined in order to obtain comparability with the Census of Population classification that was the primary source of the characteristics data, and a few industries were excluded because of lack of comparability over time. See note to Table 3.

shown in columns 1 and 2. A similar comparison for slow-growing industries is presented in columns 3 and 4.

We see that the sector differences discussed earlier in this chapter are still evident. In nearly every instance the critical difference is between the sectors, not between fast-growing and slow-growing industries. The only exception is the percentage of employees with twelve or more years of schooling. This percentage is still higher for the Service sector for all groups, but the differential within each sector between fast-growing and

slow-growing industries is greater than the differential between the sectors for industries with similar growth rates. With this one exception, the hypothesis that the observed sector differentials are really differences between fast- and slow-growing industries is refuted.

Implications for Economic Analysis

The growth of the Service sector has important implications for economic analysis. In some respects, the current situation is analogous to the shift from agriculture to industry. In retrospect, it is apparent that this shift had considerable influence on economic analysis: land became less important as an input in production and distribution models, and physical capital became much more important. The need for a theory of imperfect competition became more apparent. Short-run supply curves could no longer be thought of as completely inelastic, and the possibilities of increasing returns had to be examined with greater rigor.

Although all the necessary theoretical tools can be found in one form or another in the writings of the earliest economists, the development and refinement of concepts are often related to changes in the economy itself. Analytical work requires compromises with reality. The compromises that may be appropriate, or the second-order effects that may be neglected, in an economy dominated by agriculture and manufacturing may turn out to be inappropriate, or too important to be neglected, in an economy dominated by the service industries. I shall try to illustrate this point by reference to the analysis of productivity and growth.

The Consumer as a Factor in Production

One lesson that our study of productivity in the service industries keeps forcing upon us is the importance of the consumer as a cooperating agent in the production process. To the best of my knowledge, this point is neglected in the analysis of productivity in goods-producing industries, as well it might be. After all, productivity in the automobile industry is not affected by whether the ultimate drivers are bright or stupid, or whether they drive carefully or carelessly.

In services, however, the consumer frequently plays an important role in production. Sometimes, as in the barber's chair, the role is essentially passive. In such cases the only conceptual adjustment called for is to recognize that the time of the consumer is also a scarce resource.[6] But in

[6] See Gary S. Becker, "A Theory of the Allocation of Time," *Economic Journal*, September 1965.

the supermarket and laundromat the consumer actually works, and in the doctor's office the quality of the medical history the patient gives may influence significantly the productivity of the doctor. Productivity in banking is affected by whether the clerk or the customer makes out the deposit slip—and whether it is made out correctly or not. This, in turn, is likely to be a function of the education of the customer, among other factors. Productivity in education, as every teacher knows, is determined largely by what the student contributes, and, to take an extreme case, the performance of a string quartet can be affected by the audience's response. Thus we see that productivity in many service industries is dependent in part on the knowledge, experience, and motivation of the consumer. Consider, for instance, what would happen to service-industry productivity in the United States if technology and capital and labor inputs remained as they are, but the consumers were exchanged for 190 million consumers chosen at random from India.

In a similar vein, productivity can be and often is affected by the level of honesty of the consumer. If, for example, consumers can be trusted to refrain from stealing merchandise, to report prices and costs properly at check-out counters, and to honor verbal commitments for purchases and other contracts, there can be tremendous savings in personnel on the part of producers of services.[7] These savings are probably important when comparisons are made with productivity in other countries or with the same country at different points in time. It may be that qualities such as honesty are themselves functions of the general level of productivity and income. A full analysis of productivity, therefore, requires consideration of these interrelations.

Labor-Embodied Technological Change

A second example of an analytical implication of the growth of service-industry employment concerns the labor embodiment of technological change. This refers to a situation where technological change or an advance in knowledge affects productivity through new additions to the labor force. For example, if newly trained doctors, after receiving the same amount of schooling as their predecessors, know more about disease and are more effective in treating sick people, we should attribute the increase in output to labor-embodied technological change.

Most previous discussions of embodiment have concentrated on physi-

[7] Changes in the honesty of employees have implications for productivity in the Industry sector as well as in services; changes in the honesty of consumers have implications primarily for services.

cal capital.[8] It has typically been assumed that capital is a fixed factor and that labor is variable, as in the following statement by Salter. "By investing in fixed capital equipment an entrepreneur gives 'hostages to fortune'; a decision to employ fixed capital equipment is irrevocable in contrast to labor, which can be discharged at will." [9] This may be a reasonably satisfactory description of the situation in manufacturing (though probably less so now than formerly), but it will not do for much of the Service sector. In fact, given the growing opportunity to rent capital equipment (e.g., computers), the reverse is sometimes closer to the truth. If one argues that rented capital equipment represents an ir-revocable commitment for society, if not for the particular firm or indus-try using it, the same can be said for the supply of labor, and the distinc-tion loses all force.

Let us imagine, for instance, a technological change in some govern-ment activity—a change that requires new labor skills. Civil service rules may prohibit the firing of old employees, and it may be difficult to train them in the new techniques. The full benefits of the advance, therefore, will not be realized immediately. If this type of technological change occurs at an even rate, the rate of change in productivity in government will be unaffected even though the level will be less than optimal.[10] But such changes probably do not occur at a smooth rate. If the output of the government agency is accelerating rapidly, it is likely that new addi-tions of capital and labor are being made and that they can incorporate the latest technological change, thus raising the average level of produc-tivity. This may be one reason that changes in output and changes in productivity are sometimes found to be positively correlated.

The argument applies not only to government but to all industries in which individuals are attached to specific organizations for long periods of time (through contract, moral commitment, or high hiring costs) and cannot easily be replaced by others. Such long-term attachments are common in many service industries. To be sure, sometimes the existing labor force can be trained or adapted to take advantage of technological change, but in many cases this is not easy to accomplish. Economics

[8] See W. E. G. Salter, *Productivity and Technical Change,* Cambridge, Mass., 1960; R. M. Solow, "Technical Progress, Capital Formation, and Economic Growth," *American Economic Review Proceedings,* May 1962, pp. 76–86; and E. F. Denison, "The Unimportance of the Embodied Question," *American Eco-nomic Review,* March 1964, pp. 90–93. For reference to labor embodiment see Gary S. Becker, *Human Capital,* New York, NBER, 1964, p. 143.

[9] *Productivity and Technical Change,* p. 38.

[10] Current methods of measuring output in government *assume* no change in productivity. This discussion is concerned with the effects on true productivity.

professors who lack knowledge of modern mathematical techniques provide a good example close to home.

The question may be raised why, if technological change is embodied in new entrants to the labor force, do we usually find that older workers earn more than do new entrants with the same number of years of schooling? The answer is, of course, that employers place a value on the experience and the maturity of the older worker which more than offsets the value of the labor-embodied technological change. If one could compare two workers of equal experience and maturity, one with the education of twenty years ago and the other with the current model, there is little doubt that the latter would command higher earnings. This is particularly evident in fields experiencing rapid technological change, such as engineering, where recent graduates often earn as much as old-timers do despite the maturity and experience of the latter.

The concept of labor embodiment is likely to be most relevant when formal schooling and job security are important, as in the professional and technical occupations. Three-fourths of all professional and technical workers are employed in the Service sector.

Changes in Demand and Productivity

Another area where the growth of services may require some refinement of concepts is the analysis of the relation between changes in demand and changes in productivity. In many service industries it is not enough to know by *how much* demand has changed in order to predict the effect on productivity. At least two other dimensions of demand in addition to quantity must be specified.

One source of variation arises because output is frequently uneven, with peaks coming at particular hours of the day, particular days of the week, and even particular weeks of the month. Such fluctuations are important for retailing, banking, barber and beauty shops, places of amusement, and some local government services. During nonpeak times there is usually idle capacity. An increase in demand, if it occurs at these times, may result in very substantial gains in productivity. On the other hand, an increase in demand occurring at times of peak demand will probably not result in any increase in productivity.

A second source of variation is the "size of transaction." [11] This refers

[11] Armen Alchian has a general theoretical discussion of this concept in "Costs and Output," in *The Allocation of Economic Resources, Essays in Honor of Bernard Francis Haley*, Stanford, 1959, but he does not apply it specifically to the service industries. See also Jack Hirschleifer, "The Firm's Cost Function: A Successful Reconstruction," *Journal of Business*, July 1962.

to the volume of business done with a single customer at a single purchase. David Schwartzman and Jean Wilburn have found examples of service industries where increased demand that takes the form of increases in the average size of transaction results in greater increases in measured productivity than does an equivalent increase in demand that takes the form of more transactions.[12] George Benston has reported a similar finding for banking, and I suspect that this is true of many service industries.[13]

The "Real" Gross National Product

My final example of how the growth of services may affect economic analysis concerns the gross national product in constant dollars. This statistic is the keystone of many studies of productivity and economic growth. Unfortunately, it is probably becoming increasingly less useful for such purposes. The reason is simple. Measures of real output in the Service sector have always been unsatisfactory; as this sector becomes more important, the aggregate measure must become less satisfactory in the absence of significant improvements in the measures for individual industries.

Another trend working in the same direction is the decrease in market labor as a fraction of all time spent in productive activity. A small increase in the fraction of the adult population in the labor force has been more than offset by decreases in average hours per week and increases in vacations and holidays. Some of the increased free time may be spent in pure leisure, but probably the bulk of it is spent in the nonmarket production of goods and services and in consumer participation in the market production of services. As I have already suggested, how well or poorly these activities are carried out will surely influence economic well-being. Furthermore, both the output and inputs involved should be included in any comprehensive measure of productivity.

Economists have long been aware that the value of real GNP as a measure of output and economic well-being differs depending upon the level of economic development. There has been a presumption that the measure becomes more useful the more highly developed the economy.[14]

Up to a point it is probably true that the higher real GNP is, the more

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[12] There is some question whether the former should be called increased output or not. Under present conventions for measuring output in many service industries, it is recorded as such.

[13] "The Cost of Bank Operations," unpublished Ph.D. dissertation, University of Chicago, 1964.

[14] Simon Kuznets wrote, "The importance of domestic activities relative to those that are part of the business system declines in the long run," *National Income and Its Composition, 1919–1938*, New York, NBER, 1941, p. 432.

reliable it is as a measure of economic welfare. But the trend may now be in the other direction, because at high levels of GNP per capita a large fraction of productive effort is devoted to services (where real output is very difficult to measure) and to other activities that are not measured at all.

An increase in home production at the expense of labor in the market reduces measured output because the former is mostly excluded from the gross national product.[15] If the outputs and inputs of home production were included, growth of this type of activity would probably tend to reduce measured productivity because of the absence of specialization and economies of scale. On the other hand, true economic welfare might be increased by such a shift if, as seems likely, labor in the market involves more disutility or less utility than labor in home production.

One example of the difficulty of measuring productivity and economic welfare at high levels of GNP per capita can be found in mortality statistics. At low or moderate levels of economic development, there is usually a negative correlation between real GNP per capita and death rates. However, we now have a situation in which GNP per capita in the United States is 50 per cent above the Swedish level, but life expectancy is considerably lower in the United States, and the death rate for males 50–54 is double the Swedish rate. The reasons for this huge difference are not known, but are probably related to the pace of work, diet, exercise, as well as the output of the health industry.

I conclude that even as we increase our efforts to measure real output in the Service sector, we must recognize that these efforts are likely to leave considerable margins of uncertainty. Future studies of growth and productivity will probably find it necessary to develop auxiliary measures of "output" and economic welfare to be used in conjunction with the gross national product.

[15] For a discussion of the shift of capital stock from business to the household economy, see F. Thomas Juster and Robert E. Lipsey, "Consumer Asset Formation in the United States," *Economic Journal,* December 1967.